Before the
Federal Communications Commission
Washington, D.C. 20554

Office of Engineering and Technology Announces Technological Advisory Council (TAC) Noise Floor Technical Inquiry	)))))	ET Docket No. 16-191

COMMENTS OF THE NATIONAL ASSOCIATION OF BROADCASTERS

I. INTRODUCTION

The National Association of Broadcasters[1] commends the Commission's Technological Advisory Council for opening an inquiry into the significant and growing problem of increasing spectrum noise – unwanted radio frequency energy from man-made sources.[2] We urge the Commission to address noise interference aggressively and expeditiously, consistent with the Commission's duty to manage the use of RF spectrum. Failure to do so risks devaluing licensed spectrum and drowning licensed users in a sea of noise.[3]

II. THE FCC ITSELF MUST CONTROL RF NOISE

The FCC was created to address the interference chaos that threatened to destroy nascent radio services in the early 20th century. An unsustainable

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[1] The National Association of Broadcasters ("NAB") is the nonprofit trade association that advocates on behalf of free local radio and television stations and broadcast networks before Congress, the Federal Communications Commission and other federal agencies, and the courts.

[2] *Office of Engineering and Technology Announces Technological Advisory Council (TAC) Noise Floor Technical Inquiry*, Public Notice, ET Docket No. 16-191, DA 16-676 (June 15, 2016).

[3] Robert Weller, "Sea of Noise," IEEE Broadcast Technology Society Newsletter, Spring 2014.

interference environment prompted Congress to establish an agency (originally the Federal Radio Commission, now the FCC) responsible for maximizing the utility of the radio spectrum for the benefit of the public. Today's worsening noise problem threatens to recreate the very disorder that the Commission was established to eradicate.

Effective spectrum management must assess both the likelihood of interference and the costs of disrupting existing services. Noise is caused largely by the proliferation of cheap and simple electronic designs with little or no regulatory oversight or enforcement. At the same time, the shift of radio communication systems from analog to digital increases, in many cases, the susceptibility of communications systems to such noise interference. Digital systems improve spectrum efficiency in part by packing more bits into a given bandwidth using compression. One challenge with compression is that it also magnifies any interference; thus increased care that must be taken in limiting interfering signals such as noise. Further, because reception of digital signals is generally "all or nothing" – meaning that reception shifts from perfect to non-existent over a narrow range of signal level or interference – digital signals are often more fragile than analog signals.

Conventional wisdom is that digital radio technologies today tend to be more robust than their analog predecessors.[4] While it is true that many digital systems can operate closer to the noise floor than their analog counterparts, a rising noise floor

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[4] Silicon Flatirons Conference on Radio Spectrum Pollution: Facing the Challenge of a Threatened Resource, November 14, 2013, available at: http://www.silicon-flatirons.org/documents/conferences/2013-11-14%20Spectrum/Silicon%20Flatirons%20Keynote%2011-13-14.pdf.

offsets that advantage, and underscores the need for Commission oversight and enforcement.

III. THE COMMISSION CAN BEST ADDRESS NOISE INTERFERENCE BY ADDRESSING THE CAUSE OF THE PROBLEM

As the Commission has noted, AM radio is particularly susceptible to interference from electronic devices of all types, including such ubiquitous items as video displays, electric motors, vehicle electrical systems, fluorescent lighting, computers, and power lines.[5] According to the Commission, "The noise on the AM band that is caused by those sources is only expected to increase as electronic devices continue to proliferate."[6] That need not be the case, however, and the Commission should not simply accept reduced consumer benefits as a result of increased noise.

The FM radio service, in its transition to digital, has also been the victim of noise interference. In 2002, when the FCC authorized In-Band On-Channel (IBOC) transmission, allowing digital radio, the Commission set the power level for digital carriers at one percent of the analog power level (-20 dBc). This injection level was set based on theoretical analysis and laboratory testing that did not adequately consider the effects of environmental noise, among other things. Consequently, following deployment, many FM stations found themselves unable to replicate their analog coverage with their digital signal. As a result, the Commission approved a blanket authorization to increase IBOC power to -14 dBc for most stations, with power

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[5] *Revitalization of the AM Radio Service*, Notice of Proposed Rulemaking, 28 FCC Rcd 15221, ¶ 5 (2013).
[6] *Id.*

levels up to -10 dBc (a ten-fold increase over the 2002 power level) for some stations.[7] This power increase has helped to overcome local noise sources affecting FM reception, but increasing power to overcome noise is treating the symptom rather than the underlying disease. Increasing transmitter power to overcome interference can itself create more interference. It is simply poor spectrum policy to continue to battle interference with techniques that ultimately create more interference, and does not comport with the general requirement in the Communications Act to "use the minimum amount of power necessary to carry out the communication desired."[8]

During the 2009 completion of the transition from analog to digital television, many consumer complained of difficulty receiving transmissions on VHF channels. In response, the Office of Engineering and Technology worked with its Enforcement Bureau field staff to develop a survey to attempt to diagnose viewer reception problems. In many cases, the Commission confirmed RF interference from nearby sources (often within the consumer's own residence). Elimination of the offending noise source often resulted in perfect digital TV reception.

As a result, the FCC created an entirely new service to remedy VHF DTV reception issues: the Replacement Digital Television Translator Service.[9] Of the 81 stations that applied for this service, over half were VHF stations. Many of these stations later applied to the FCC to change channels from VHF to UHF, in part to

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[7] Alan W. Jurison, "Field Observations of Elevated FM HD IBOC Power Levels," Proc. 2014 NAB Broadcast Engineering Conference, pp. 103-112.
[8] 47 USC § 324.
[9] *New Translator Service Can Help TV Stations Correct Signal Loss Caused by Digital Transition*, News Release (May 11, 2009) available at: https://apps.fcc.gov/edocs_public/attachmatch/DOC-290659A1.pdf.

overcome noise interference issues. Unfortunately, the FCC has not addressed those underlying noise issues.

Noise also creates interference to DTV operations on UHF channels. The current limits in Sections 15.109 and 15.209 of the Commission's rules were developed to protect analog television operations and assume that the interfering signals being generated by devices would be narrow-band in nature and might be rejected by the receiver. These assumptions are outdated. In fact, Part 15 devices tend to operate with digital modulation and wider bandwidths and the noise generated by these devices tend to be wideband. Broadband or multi-frequency emissions from Part 15 devices can contribute a greater amount of interference power within the 6 MHz TV channel than envisioned when the narrowband emission limits were developed. The effect of multiple Part 15 devices operating in proximity to a DTV receiver exacerbates the potential for interference.[10] A similar problem may arise for new wireless services operating in the 600 MHz band following a successful incentive auction. We urge the Commission to take action to address these concerns.

First, the Commission should review the general Part 15 emission limits to determine what improvements are necessary to protect licensed services, and adopt strict and enforceable limits that will limit noise interference.[11] We urge the FCC to undertake a comprehensive noise study that considers factors such as digital transmission and reception and receiver sensitivity.

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[10] Washington Laboratories, Ltd., "Effects of Multiple Class B Emitters on Emissions Levels and the Impact on Broadcast Services Reception," March 2002.
[11] For example, the 200 μV/m limit in the UHF frequency band is actually higher than the desired DTV signal level received by a viewer at a television station's protected contour.

At a minimum, the Commission should adopt radiated emissions limits to protect AM radio operations. While Part 15 of the Commission's rules specifies radiated emission limits for many types of devices, there are no emission limits for devices operating on frequencies below 30 MHz. This means that the AM band is afforded no quantitative protection at all. Under Part 18, radiated emissions outside the ISM bands allow for 10 uV/m at one mile and 25 uV/m at 1000 feet. The protected service contour for AM coverage by most stations is 0.5 mV/m,[12] while the interference protection ratio for groundwave-to-groundwave is 20:1.[13] By adopting and enforcing radiated emission limits of 0.025 mV/m, measured at a distance of 10 meters, the FCC could eliminate much of the interference that exists today and better protect stations in the AM service.

Second, the Commission should re-examine Section 15.13 of its rules. Section 15.13 specifies that manufacturers of incidental radiators shall employ "good engineering practices to minimize the risk of harmful interference." However, the Commission provides no guidance as to what constitutes "good engineering practices." In the past, the Commission relied on a set of standards that constituted Good Engineering Practice. Some of these standards are reflected in the Commission's current rules, but many are not. These Good Engineering Practice standards were set forth in FCC field engineering and enforcement manuals, but apparently are no longer maintained or used. Absent any further guidance, this rule is largely meaningless and unenforceable in practice.

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[12] 47 CFR 73.182(d).
[13] *See Report on the Status of the AM Broadcast Rules,* RM-5532, 19 (April 3, 1986).

IV. CONCLUSION

NAB commends the TAC for investigating the impact of man-made noise on radio reception. The Commission's existing limits on intentional, unintentional and incidental radiation are inadequate to protect licensed radio services, particularly broadcast services. We urge the Commission to undertake a comprehensive review of these limits and develop specific and enforceable limits to prevent further noise interference.

Respectfully submitted,

NATIONAL ASSOCIATION OF BROADCASTERS
1771 N Street, NW
Washington, DC 20036
(202) 429-5430

Rick Kaplan
Patrick McFadden

Bruce Franca
Alison Neplokh
Robert Weller

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APPENDIX A – RESPONSES TO SPECIFIC TAC QUESTIONS

1. Is there a noise problem?

Yes. Increasing levels of RF noise, especially from unlicensed devices, are adversely affecting radio and television reception. The problem is getting worse because the additive effect of an increasing number of such devices is increased noise. This is compounded by the use of digital transmission systems, which typically stop working completely above some interference threshold.

a. If so, what are the expected major sources of noise that are of concern?

Some of the commonly reported sources of RF interference include switching power supplies in consumer and commercial equipment of all types, electric power transmission lines, LED lighting (including traffic lights), and composite video display systems (such as those present in Times Square, Las Vegas, and other locations).

b. What services are being most impacted by a rising spectrum noise floor?

All commercial and non-commercial radio services, including AM, FM, and Television broadcast.

c. If incidental radiators are a concern, what sorts of government, industry, and civil society efforts might be appropriate to ameliorate the noise they produce?

Education and increased enforcement by the Commission is the most effective tool to ameliorate noise. For example, in the case of electric power transmission lines, active FCC field enforcement formerly caused many utility companies to maintain engineers and technicians to respond to complaints of interference by field investigation.

In the case of devices, there is a strong incentive to cut costs by removing RF-suppression equipment that does not affect day-to-day operation of the device. At present there is no requirement for a post-market sampling or measurement program to detect such modifications. Either the manufacturer or the FCC, or both, need to have a robust enforcement program that includes sampling of retail products for compliance.

2. Where does the problem exist?

a. Spectrally

Interference problems due to RF noise are generally inversely proportional with frequency. Services such as AM radio and VHF television are affected before services operating at higher frequencies.

i. What frequency bands are of the most interest?

The bands of greatest interest are: 0.54-1.7 MHz; 54-108 MHz; 174-216 MHz; and 470-698 MHz.

b. Spatially

Interference due to RF noise is most prevalent in urban areas because of the increased density of noise-emitting devices and susceptible receivers.

i. Indoors vs outdoors?

Indoor reception is typically more problematic because the signal levels are generally weaker and the noise sources are generally closer to the receiving antenna.

ii. Cities vs rural settings?

Interference due to RF noise is generally worse in cities because the density of noise sources is greater.

iii. How close in proximity to incidental radiators or other noise sources?

There is substantial variation depending upon the noise source and the receiver. RF noise generated by electric transmission lines can affect reception thousands of feet away, while noise generated by a switching power supply may affect reception over a much smaller distance.

c. Temporally

i. Night versus day?

ii. Seasonally?

There is substantial variation depending upon the noise source. Because lighting and large video displays are more commonly used at night, the noise problem appears to be worse at that time. Noise from electric power lines appears to be more severe during the summer months.

3. Is there quantitative evidence of the overall increase in the total integrated noise floor across various segments of the radio frequency spectrum?

Yes. For example, comparison of noise levels at the IIT observatory in TV Channel 37 (608-614 MHz) between 2010 and 2015 appears to show an increase in the noise floor.[1]

a. At what levels does the noise floor cause harmful interference to particular radio services?

While there is variation depending upon the service involved, many services require protection from interference of about 15-20 dB below the threshold required for service. In the case of AM radio, this level is about 0.025 mV/m. In the case of FM radio, this level is about 34 dBuV/m. In the case of UHF DTV, this level is about 26 dBuV/m.

b. What RF environment data from the past 20 years is available, showing the contribution of the major sources of noise?

A number of spectrum observatories have collected data at various frequency bands. Much of those data appear to not be available in a format that is easily machine readable.

[1] http://wincom-monitor.dyndns.info/